

**REMARKS**

Claims 13-23 are pending in this application. By this Amendment, claims 13-15, 18 and 23 are amended. Support for the amendments to claims 13-15, 18 and 23 can be found in the specification as originally filed, for example, at page 4, lines 14 – page 6, line 19; page 9, lines 6-15 and page 10, lines 9-14; and in claims 2, 7, 12-15, 18 and 23 as originally filed. No new matter is added by these amendments.

In addition, the specification is amended. Support for the amendments to the specification can be found in the specification as originally filed, for example, at page 9, lines 6-15 and page 10, lines 9-14. No new matter is added by these amendments.

**I. Objections to the Specification**

The Office Action objects to the specification, alleging that “[on] page 9, lines 5-15 the 80-20% water insoluble film forming polymer cannot accommodate 100% quaternary ammonium or phosphonium functional film forming polymer.” While Applicants do not necessarily agree with this objection, Applicants respectfully submit that the specification has been amended herein to more clearly set forth the subject matter of the paragraph beginning on page 9 at line 6. Reconsideration and withdrawal of the objection are respectfully requested.

**II. Claim Rejections Under 35 U.S.C. §112 and §101**

The Office Action rejects claims 14, 18 and 23 under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention. The Office Action further rejects claim 23 under 35 U.S.C. §101, as an improper method claim. Applicants respectfully traverse these rejections.

In particular, claim 14 is rejected as allegedly being indefinite because of the word “type.” While Applicants do not necessarily agree with this rejection, Applicants respectfully

submit that claim 14 has been amended to more clearly set forth the subject matter recited therein. Reconsideration and withdrawal of the rejection are respectfully requested.

The Office Action rejects claim 18 for the same reasons as the objection to the specification. While Applicants do not necessarily agree with this rejection, Applicants respectfully submit that claim 18 has been amended herein to more clearly set forth the subject matter recited therein. Reconsideration and withdrawal of the rejection are respectfully requested.

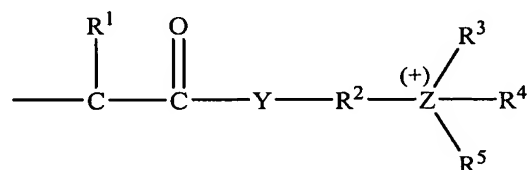
The Office Action rejects claim 23 under §112, second paragraph, and under §101 as being indefinite and improper for failing to recite any process steps. Applicants respectfully submit that claim 23 sets forth a specific process step, "coating said structures with the composition of claim 15." Applicants respectfully submit that claim 23 is not indefinite or improper, as claim 23 sets forth a positive process step. Reconsideration and withdrawal of the rejection are respectfully requested.

### III. Claim Rejections Under 35 U.S.C. §102

#### A. Claims 13-23

The Office Action rejects claims 13-23 under 35 U.S.C. §102(e) over U.S. Patent No. 6,479,566 to Lines et al. Applicants respectfully traverse this rejection.

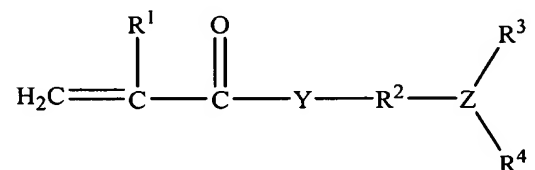
Independent claims 13 and 15, in pertinent part, set forth a "sea water-insoluble polymer comprising quaternary ammonium groups and/or quaternary phosphonium groups bound to a backbone of the polymer comprising a group of formula:



wherein Y is O or NH, Z is N or P, R<sup>1</sup> is a hydrogen atom or a C<sub>1</sub>-C<sub>4</sub> alkyl group, R<sup>2</sup> is a C<sub>2</sub> or a C<sub>3</sub>-C<sub>12</sub> divalent hydrocarbon group, R<sup>3</sup> and R<sup>4</sup> independently represent a C<sub>1</sub>-C<sub>6</sub> alkyl

group,  $R^5$  is a  $C_1$ - $C_5$  alkyl group, said quaternary ammonium groups and/or quaternary phosphonium groups being neutralised by counter-ions that consist of the anionic residue of an acid having an aliphatic, aromatic, or alkaryl hydrocarbon group comprising 6 or more carbon atoms; said counter-ions being capable of hydrolyzing, dissociating or exchanging with sea water species to leave a polymer framework that is soluble in sea water."

Independent claim 14 sets forth a "process for the preparation of a sea water-insoluble polymer comprising quaternary ammonium groups and/or quaternary phosphonium groups bound to the backbone of the polymer, comprising the steps of: quaternizing an amine- or phosphine-functional monomer of formula (I):



wherein Y is O or NH, Z is N or P,  $R^1$  is a hydrogen atom or a  $C_1$ - $C_4$  alkyl group,  $R^2$  is a  $C_2$  or a  $C_3$ - $C_{12}$  alkylene group,  $R^3$  and  $R^4$  independently represent a  $C_1$ - $C_6$  alkylene group or an optionally substituted phenyl group, replacing a counter-ion of the quaternised ammonium or phosphonium monomer by a carboxylate group derived from an acid having an aliphatic, aromatic, or alkaryl hydrocarbon group comprising 6 or more carbon atoms, and polymerizing at least one type of long-chain acid-capped quaternary ammonium monomer and/or at least one type of long-chain, acid-capped quaternary phosphonium-functional monomer; wherein said counter-ions being capable of hydrolyzing, dissociating or exchanging with sea water species to leave a polymer framework that is soluble in sea water." Claims 16-23 depend directly or indirectly from claim 15 and incorporate all of the limitations thereof.

The Office Action takes the position that Lines discloses the claimed polymer and the claimed process for preparing a polymer. Applicants respectfully disagree.

Lines discloses an acid-functional film-forming polymer containing acid functional groups that are blocked by quaternary ammonium or quaternary phosphonium compounds. *See* Lines, col. 2, lines 18-23; col. 2, lines 55-61. Lines also discloses a method of preparing its acid-functional film-forming polymer by reacting an acid-functional polymer with quaternary ammonium groups or by polymerizing a quaternary ammonium salt of an ethylenically unsaturated acid-functional monomer. *See* Lines, col. 3, lines 22-39. However, Lines does not disclose polymers in which quaternary ammonium or quaternary phosphonium groups are bound in the polymer backbone and neutralized by the anionic residue of an acid, as set forth in claims 13 and 15, or methods for making such polymers, as set forth in claim 14. *See generally* Lines. Rather, Lines teaches that quaternary ammonium and quaternary phosphonium groups are instead used as blocking groups, neutralizing acid functional groups, but are not bound to the polymer backbone. Thus, Lines does not teach a "sea water-insoluble polymer comprising quaternary ammonium groups and/or quaternary phosphonium groups bound to a backbone of the polymer comprising a group of [the claimed] formula," as set forth in independent claims 13 and 15, or a "process for the preparation of a sea water-insoluble polymer comprising quaternary ammonium groups and/or quaternary phosphonium groups bound to the backbone of the polymer," as set forth in independent claim 14.

Because Lines does not teach all of the elements of independent claims 13-15 and dependent claims 16-23, Applicants respectfully submit that claims 13-23 are patentable over Lines. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

**B. Claims 13 and 14**

The Office Action rejects claims 13 and 14 under 35 U.S.C. §102(b) over each of U.S. Patent Nos. 4,180,643 to Moss et al.; 4,311,805 to Moritani et al.; 4,594,365 to Russell et al.; and 6,251,967 to Perichaud et al. Applicants respectfully traverse these rejections.

Claims 13 and 14 are as set forth above.

**1. Moss**

The Office Action takes the position that Moss teaches all of the features of independent claims 13 and 14, because Moss allegedly teaches the claimed polymer and the claimed process in claims 1-5 and the examples. Applicants respectfully disagree.

Moss discloses acrylamide or methacrylamide monomers having quaternary ammonium groups capped with organic or inorganic acids. *See Moss*, col. 1, lines 26-37; col. 2, lines 20-32. Moss also discloses a method of preparing its monomers by reacting acrylic or methacrylic compounds that have a structure  $\text{CH}_2\text{CR}^1\text{COX}$  with amines having the structure  $\text{HR}^2\text{N}-(\text{C}_n\text{H}_{2n})-\text{NR}^3\text{R}^4$ , and then quaternizing the product in the presence of an organic or inorganic acid. *See Moss*, col. 2, line 41 - col. 3, line 19.

However, Moss does not disclose sea water-insoluble polymers in which quaternary ammonium or quaternary phosphonium groups are bound to the polymer backbone and neutralized by the anionic residue of an acid, as set forth in claim 13, or processes for the preparation of such sea water-insoluble polymers, as set forth in claim 14. *See generally Moss*. Rather, Moss teaches only monomers having acid neutralized quaternary ammonium groups. Thus, Moss does not teach sea water-insoluble polymers, as set forth in independent claim 13, or processes for the preparation of such sea water-insoluble polymers, as set forth in independent claim 14.

Because Moss does not teach all of the elements of independent claims 13 and 14, Applicants respectfully submit that claims 13 and 14 are patentable over Moss. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

## 2. Moritani

The Office Action takes the position that Moritani teaches all of the features of independent claims 13 and 14, because Moritani allegedly teaches the claimed polymer in claims 1-17 and the claimed process in claims 18-29. Applicants respectfully disagree.

Moritani discloses polymers comprising quaternary ammonium groups that are neutralized by the anionic groups. *See* Moritani, col. 6, lines 2-4. Moritani teaches that the anionic groups may be halogens, such as chlorine, bromine or iodine; methyl sulfates; or p-toluene sulfonates, with chlorine being preferred. *See* Moritani, col. 6, lines 9-11. Moritani also discloses that, when tertiary amine monomers are employed, the quaternized ammonium ions may be in the form of salts of hydrochloric acid, sulfuric acid or acetic acid. *See* Moritani, col.6, lines 40-43. Moritani also discloses methods for producing such polymers. *See* Moritani, col. 4, line 46 - col. 6, line 46.

However, Moritani does not teach sea water-insoluble polymers in which quaternary ammonium or quaternary phosphonium groups are bound to the polymer backbone and neutralized by the anionic residue of an acid having an aliphatic, aromatic, or alkaryl hydrocarbon group comprising 6 or more carbon atoms, as required by claim 13, or processes for the preparation of such sea water-insoluble polymers, as set forth in claim 14. The polymers of claim 13 and of the process of claim 14 are insoluble in sea water. In particular, these polymers become sea water soluble only after hydrolysatation, dissociation or exchange of the counter-ions with sea water species. *See* Specification, page 9, lines 6-15. In contrast, the polymers disclosed in Moritani are water soluble. *See* Moritani, col. 3, lines 63-64; claims 1, 9, 18, 26, 27, 30. Thus, Moritani does not teach sea water-insoluble polymers, as

set forth in claim 13, or processes for the preparation of such sea water-insoluble polymers, as set forth in claim 14.

Because Moritani does not teach all of the elements of independent claims 13 and 14, Applicants respectfully submit that claims 13 and 14 are patentable over Moritani. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

**3. Russell**

The Office Action takes the position that Russell teaches all of the features of independent claims 13-15 and dependent claims 16-23, because Russell teaches anti-fouling paint that allegedly comprises the claimed polymer and the claimed process for preparing the polymer. Applicants respectfully disagree.

Russell discloses polymers that may comprise quaternary ammonium groups neutralized by chlorine, bromine or iodine. *See* Russell, col. 4, line 50; col. 6, line 29. Russell also discloses methods for producing such polymers. *See* Russell, col. 9, line 1 - col. 10, line 30.

However, Russell does not teach sea water-insoluble polymers in which quaternary ammonium or quaternary phosphonium groups are bound to the polymer backbone and neutralized by the anionic residue of an acid having an aliphatic, aromatic, or alkaryl hydrocarbon group comprising 6 or more carbon atoms, as required by claim 13, or processes for preparing such sea water-insoluble polymers, as set forth in claim 14. Rather, Russell teaches only that its quaternary ammonium groups may be neutralized by halide ions. *See* Russell, col. 4, line 50; col. 6, line 29. As discussed in the instant specification, halide-capped quaternary ammonium groups render the polymeric binder partially sea water-soluble. *See* Specification, page 2, lines 19-27. Thus, Russell does not teach sea water-insoluble polymers, as set forth in independent claim 13, or processes for the preparation of such sea-water-insoluble polymers, as set forth in independent claim 14.

Because Russell does not teach all of the elements of independent claims 13 and 14, Applicants respectfully submit that claims 13 and 14 are patentable over Russell.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

#### 4. Perichaud

The Office Action takes the position that Perichaud teaches all of the features of independent claims 13 and 14, because Perichaud allegedly teaches the claimed polymer in claims 1-19 and the claimed process in claims 20-22. Applicants respectfully disagree.

Perichaud discloses anti-microbial polymers that may be used in marine paints. *See* Perichaud, col. 1, lines 8-60. The Perichaud polymers include quaternary ammonium groups in which R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub> groups are bonded to the quaternary nitrogen. *See* Perichaud, col. 2, lines 21-38. The R<sub>1</sub> and R<sub>2</sub> groups of the Perichard polymers each represent a C<sub>1</sub>-C<sub>5</sub> alkyl chain and may be the same or different. *See* Perichard, col. 2, lines 57-58. The R<sub>3</sub> group of Perichard represents a C<sub>8</sub>-C<sub>20</sub> alkyl chain, an aryl group, or an arylalkyl group. *See* Perichaud, col. 2, lines 59-60.

However, Perichaud does not teach sea water-insoluble polymers in which quaternary ammonium or quaternary phosphonium groups are bound to the polymer backbone and neutralized by the anionic residue of an acid having aliphatic, aromatic or alkaryl hydrocarbon group comprising 6 or more carbon atoms, as set forth in claim 13, or processes for the preparation of such sea water-insoluble polymer, as set forth in claim 14.

The quaternary nitrogen atoms of the polymers of claims 13 and 14 are bonded to R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> groups. The R<sup>3</sup> and R<sup>4</sup> groups, to which Perichard's R<sub>1</sub> and R<sub>2</sub> correspond, each represent a C<sub>1</sub>-C<sub>6</sub>, alkyl group and may be the same or different. The claimed R<sup>5</sup> group represents a C<sub>1</sub>-C<sub>5</sub> alkyl group. In contrast, Perichaud's R<sub>3</sub> group is defined as one of a C<sub>8</sub>-C<sub>20</sub> alkyl group, an aryl group or an arylalkyl group. That is, Perichaud's R<sub>3</sub> group excludes the claimed R<sup>5</sup> group. Thus, Perichard does not teach the sea water-insoluble polymers of



independent claim 13 or the processes of independent claim 14 for the preparation of such sea water-insoluble polymers.

Because Perichaud does not teach all of the elements of independent claims 13 and 14, Applicants respectfully submit that claims 13 and 14 are patentable over Perichaud. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

**C. Claims 13-16**

The Office Action rejects claims 13-16 under 35 U.S.C. §102(b) over each of Russell and British Patent Application Publication No. GB 2,273,934 to Witco GmbH. Applicants respectfully traverse these rejections.

Claims 13-15 are as set forth above. Claim 16 depends from claim 15 and incorporates all of the limitations thereof.

**1. Russell**

The Office Action takes the position that Russell teaches all of the features of independent claims 13-15 and dependent claim 16, for the reasons set forth above in section III.B.3. Applicants disagree and respectfully traverse this rejection for at least the same reasons set forth above in section III.B.3. Reconsideration and withdrawal of the rejection are respectfully requested.

**2. Witco GmbH**

The Office Action takes the position that Witco GmbH teaches all of the features of independent claims 13-15 and dependent claims 16-23 because Witco GmbH allegedly teaches an antifouling paint comprising the claimed polymer in its claims 1-14 and the claimed process in its Examples. Applicants respectfully disagree.

Witco GmbH discloses polymer binders including quaternary ammonium groups that are bound to the polymer backbone. *See* Witco GmbH, Abstract. The Witco GmbH quaternary ammonium groups may be bonded to three independently selected groups chosen

from hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl groups, and substituted benzyl groups. *See* Witco GmbH, page 6, lines 7-11. The quaternary ammonium groups are capped with counter-ions chosen from bromine, chlorine and iodine ions. *See* Witco GmbH, page 6, line 12.

However, Witco GmbH does not disclose sea water-insoluble polymers in which quaternary ammonium or quaternary phosphonium groups are bound to the polymer backbone and neutralized by the anionic residue of an acid that includes an aliphatic aromatic or alkaryl hydrocarbon group having 6 or more carbon atoms, as set forth in claims 13 and 15, or processes for the preparation of such sea water-insoluble polymers, as set forth in claim 14. Rather, Witco GmbH teaches that its counter-ions are halides. *See* Witco GmbH, Abstract; page 6, line 12. As discussed in the instant specification, halide-capped quaternary ammonium groups render the polymeric binder partially sea water-soluble. *See* Specification, page 2, lines 19-27. Thus, Witco GmbH does not teach sea water-insoluble polymers, as set forth in independent claims 13 and 15, or processes for the preparation of such sea water-insoluble polymers, as set forth in independent claim 14.

Because Witco GmbH does not teach all of the elements of independent claims 13-15, Applicants respectfully submit that claims 13-15, and dependent claims 16-23, are patentable over Witco GmbH. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

#### **IV. Claim Rejections Under 35 U.S.C. §103**

The Office Action rejects claims 13-23 under 35 U.S.C. §103(a) over Witco GmbH in view of International Patent Application Publication No. WO 02/02698 to International Coatings Ltd., asserting that incorporating the rosin and auxiliary film-forming resin of International Coatings Ltd. into the compound of Witco GmbH would have been obvious to one of ordinary skill in the art. Applicants respectfully traverse this rejection.

Claims 13-15 are as set forth above. Claims 16-23 depend from claim 15 and incorporate all of the limitations thereof.

The Office Action takes the position that the subject matter of pending claims 13-23 would have been obvious to one of ordinary skill in the art, based on the teachings of Witco GmbH and International Coatings. In particular, the Office Action asserts that, at the time of invention, incorporating the rosin and auxiliary film-forming resin of International Coatings into the Witco GmbH compound would have been an obvious way of ensuring gradual biocide leaching and slow polymer erosion. Applicants respectfully disagree.

As discussed above in section III.C.2, Witco GmbH does not disclose, nor does it suggest, the sea water-insoluble polymers of independent claims 13 and 15 or processes of independent claim 14 for preparing such sea water-insoluble polymers. Instead, the polymers of Witco GmbH are partially sea water-soluble. Thus, Witco GmbH cannot alone support a rejection of claims 13-15 or their dependent claims.

International Coatings does not remedy the shortcomings of Witco GmbH.

International Coatings Ltd and Lines, which is discussed above in section III.A, claim priority to European Patent Application No. 00305726, filed on July 6, 2002, and contain the same teachings, as admitted by the Office Action. In particular, International Coatings, like Lines, teaches polymers, and methods for making polymers, in which quaternary ammonium and quaternary phosphonium groups neutralize acid functional groups and are used as blocking groups, but are not bound to the polymer backbone. *See* International Coatings, page 3, lines 4-8; page 4, lines 5-10; page 5, lines 4-16. Applicants respectfully submit that the arguments set forth above with respect to Lines apply equally to International Coatings. That is, International Coatings does not disclose, nor does it suggest, sea water-insoluble polymers, as set forth in claims 13 and 15, or processes for the preparation of such sea water-polymers, as set forth in claim 14.

Because neither Witco GmbH nor International Coatings teaches or suggests the sea water-insoluble polymers of independent claims 13 and 15 or the process of independent claim 14 for the preparation of such sea water-insoluble polymers, Applicants respectfully submit that the subject matter of independent claims 13-15, and dependent claims 16-23, would not have been obvious over Witco GmbH and International Coatings, individually or in combination.

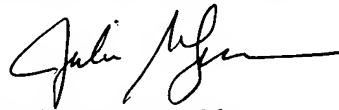
For at least these reasons, Applicants respectfully submit that claims 13-23 are patentable over Witco GmbH in combination with International Coatings. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

**V. Conclusion**

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 13-23 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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